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ESSENTIAL RANGE OF USSR LUBRICATING GREASES

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Plant instructions relating to the operation of automobiles provide for a rather wide assortment of lubricating greases: chassis lubricants, universal joint lubricants, lubricant 1-13, a graphite lubricant, several makes of fatty and synthetic solidols, etc. However, service stations do not always have a complete assortment of lubricants in stock. Frequently, automotive managements will receive only L solidol, which they are forced to reprocess, in some cases by diluting it with oil, and in other cases by adding graphite. The use of such "reprocessed" lubricants leads to trouble in the operation of units and to premature deterioration of parts.

How efficient, then, is the plant-recommended list of lubricants, and is there a way of cutting it down without detriment to the reliable maintenance of the automobiles? To answer this question it is necessary to study the manner and conditions in which lubricating greases work in automobile units.

Lubricants for Wheel Bearings

There are a number of technical specifications, reflecting the specific work of this unit, with which the lubricant for the wheel bearings must comply.

With respect to operation under various climatic conditions, the thermal cycle of lubrication shows sharp fluctuations. It is of utmost importance that the lubricant remain "soft," active, and have no excessive resistance to the rotation of the bearing when starting the automobile from a standstill. For the summer season the stability of the lubricant is of the greatest importance; there should be a minimum variation in its thickness and the absence of flaking. It should be noted that the lubricant temperature in the friction housing is 25-35 degrees centigrade higher than the surrounding air temperature.

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A very important characteristic of a lubricant is its insolubility in water. The use of a lubricant easily soluble in water may cause it to be washed out when fording shallow water or in passing over swampy ground, with consequent burning out of bearings.

The list of lubricants recommended in the plant instructions does not fully comply with the technical specifications. The solidols have a low drop-point temperature and an inadequate mechanical and thermal stability. They become soft too rapidly in operation, and change their thickness, which results in the lubricant running out from the friction housing, in the spreading of oil through the brake linings and in the deterioration of rubber tires.

However, the absence of special varieties of lubricants makes recommendations for seasonal lubrication necessary as follows: the relatively "soft" L grease for the winter, and the thicker M and T greases (or the corresponding makes of synthetic solidols) for the summer.

The use of the above lubricants for late model automobiles, capable of higher speeds and greater loads, is not always followed by positive results. This is confirmed, for example, by the tests of a fatty solidol, with a penetration number of 190 at 25 degrees centigrade, and a drop-point temperature of 88 degrees centigrade. The temperature of the lubricant near the bearing, as measured with thermocouples, ranged from 31-61 degrees centigrade. Tests revealed that a solidol of even the above-mentioned thickness with a drop-point temperature higher than provided for by GOST, became liquefied in operation, and during the running of the automobile was thrown onto the inside of the tire, forming blisters. When the hub of the wheel was disassembled, it was found that the remaining lubricants had changed in structure and formed solid coagulated soapy particles.

It should be noted that not all the consignments of solidol are deficient in stability. To a great extent, the stability of the grease depends on the quality of the raw material (the fats) and on the technological process of preparation. In particular, the synthetic solidols, prepared in accordance with the Yuga technological process, have a somewhat higher stability than the fatty solidols. Konstalin grease has good lubricating characteristics and a higher stability than solidol. However, the use of this lubricant is restricted by its solubility in water.

The most suitable lubricants for wheel bearings are the sodium-calcium lubricants (Type 1-13). They have lower moisture-sensitivity than Konstalin and a higher melting point than solidols. However, tests revealed that the 1-13 lubricant has poor lubricating characteristics because of its poor adhesion to the metal surface and also its excessive thickness. These negative features of the 1-13 lubricant are manifested particularly during the winter season, since the low activity of the lubricant does not guarantee its flow to the bearing; consequently, there is excessive friction, leading to the disintegration of the roller bearing.

GOST 1631-42 contains the following note regarding 1-13 lubricant: "As requested by consumers, the preparation of a lubricant for antifriction bearings with a higher penetration number is permitted." On the basis of this note, the Automobile Plant imeni Stalin ordered a consignment of 1-13 lubricant with penetration number of 260-280 at 25 degrees centigrade (with intermixing). The parallel tests conducted with the experimental 1-13 lubricant with a penetration of 270, and with a standard lubricant with a penetration number of 194, gave the following results: the wheel bearings in ZIS-110 automobile, with the use of the standard lubricant, stood up for 10,000 kilometers, while with the use of the experimental lubricant they stood up for 40,000-70,000 kilometers. In the latter case neither flaking nor condensations were observed.

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The change in the thickness of the 1-13 lubricant (its preparation with a penetration number within the range of 260 to 280 at 25 degrees centigrade) provides for the reliable operation of the wheel bearings both in winter and in summer and considerably increases the useful life of the bearings.

However, all the automotive equipment available cannot be supplied with the above-described 1-13 lubricant, since a high-cost castor oil base is used in its manufacture. Therefore, a specimen of 1-13 lubricant, prepared by the Central Laboratory of the Petroleum-Oil Plants Trust on a synthetic fatty acid base, was tested along with the castor oil base lubricant. The tests showed the synthetic fatty acid-base lubricant to be of equal quality with the castor oil base lubricant.

Lubricants for Universal Joint Links

The design of most modern universal joint drives consists of a shaft with ball-and-socket joints on needle bearings. Mineral oil is recommended as a lubricant for needle bearings, while for the splined joints solidol is fully satisfactory. Only in automobiles of greater roadability such as the ZIS-151, GAZ-63, etc., are special lubricating greases required for the ball-and-socket joints of constant angular velocity. Since the lubricant operating at this junction is subject to high specific loads, it must provide for greater strength of the lubrication film and greater adhesion to the surface of the metal.

The results of testing solidols and special "universal joint lubricants" (St. 2-5862-40), conducted by V. A. Listov at TsIATIM on a four-ball friction machine at 450 rpm, revealed that solidols are capable of sustaining an ultimate load of 100-110 kilograms, with the ultimate strength of the film being 8,000-9,000 kilograms per square centimeter, while the special universal joint lubricant is capable of sustaining an ultimate load of 175 kilograms, with the ultimate strength of the film being 13,600 kilograms per square centimeter.

The use of solidol for the ball-and-socket joints of the front-end driving mechanism results in the oozing out of the lubricant and the setting in of dry friction, which is betrayed by a "groaning" sound when the automobile is moving. In addition, the grease will sometimes thin out considerably, to the point of leaking out. This does not occur when universal joint lubricant is used.

Chassis Lubricants

The automobile chassis has many friction joints, for the lubrication of which solidol (GOST 1033-41), or a corresponding synthetic solidol US-S (GOST 4366-50), are recommended.

Because the conditions under which the lubricant operates at the friction joints of the automobile chassis are very severe, a thin layer of it must sustain considerable impact loads (e.g., on the spring bolts and king pins). Practically all the friction joints of the chassis operate under conditions in which their outer surfaces become caked with mud and have no protection from water.

Since preventive lubrication of the chassis is frequent (some points are greased every other day), the grease must be "soft," water-stable, and adaptable to use in a grease gun. Solidol as a chassis lubricant fully complies with these specifications.

However, due to the shortage of this grease at filling stations, automotive management frequently resort to the dilution of solidol with lubricating oil and other oils. The resulting lubricant has no stability. When used in chassis lubrication, it causes flaking, leakage, and other effects which disrupt normal operations of the joint and cause rapid wear. The above practice is particularly dangerous in the case of the steering mechanism of certain automobiles, such as the ZIS-5, which, in accordance with instructions, calls for the use of solidol.

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Lubricants for Motor Parts

For oiling the water pump shaft bearings, the special water pump lubricant (St. 2-5863-40), which has a melting point of about 100 degrees centigrade, and is insoluble in water, is to be used. Such a lubricant must be used since it comes into contact with hot water. The use of solidol in this case results in its rapid melting and washout, leading not only to rapid wear of the water pump shaft and bearings, but also to disruption of the entire water circulation and cooling system by deposits of calcium soap on the radiator surfaces.

Late-model automobiles are equipped with hermetically sealed water pump shaft bearings. Therefore the use of lubricants which are insoluble in water is not obligatory, and, in their place, high-melting water-sensitive lubricants, such as 1-13 or Konstalin, may be used.

For the camshaft and the transmission main drive gear (front), 1-13 lubricant is also recommended, since it has high heat stability.

Spring Lubricants

Automobile springs must be lubricated with a graphite lubricant (GOST 3333-46), since graphite considerably reduces the friction between the spring leaves. In the absence of the above, a mixture of solidol (85-90 percent) and graphite (10-15 percent), having no more than a 5-percent ash content, may be used.

Thus, for the reliable performance of units and joints in automobiles, the following four grades of lubricating greases are to be used:

1. Chassis lubricant (solidol).

2. Lubricant 1-13 improved, thicker, with a penetration number of 260 to 280 at 25 degrees centigrade. It is desirable to conduct extensive tests of the 1-13 lubricant which is prepared from synthetic fatty acids, and, if results are satisfactory, to increase its production considerably.

3. Graphite lubricant for springs.

4. Universal joint lubricant, according to St. 2-5862-40 (only for cars with front-wheel drive).

The Ministry for the Petroleum Industry USSR should guarantee the manufacture of the above-described lubricating greases in adequate quantities, so that service stations can supply consumers properly.

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